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Where you live matters: Structural correlates of HIV risk behavior among young men who have sex with men in Metro Detroit

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Abstract

Structural characteristics are linked to HIV/STI risks, yet few studies have examined the mechanisms through which structural characteristics influence the HIV/STI risk of young men who have sex with men (YMSM). Using data from a cross-sectional survey of YMSM (ages 18–29) living in Detroit Metro (N=328; 9% HIV-positive; 49% Black, 27% White, 15% Latino, 9% Other race), we used multilevel modeling to examine the association between community-level characteristics (e.g., socioeconomic disadvantage; distance to LGBT-affirming institutions) and YMSM's HIV testing behavior and likelihood of engaging in unprotected anal intercourse with serodiscordant partner(s). We accounted for individual-level factors (race/ethnicity, poverty, homelessness, alcohol and marijuana use) and contextual factors (community acceptance and stigma regarding same-sex sexuality). YMSM in neighborhoods with greater disadvantage and nearer to an AIDS Service Organization were more likely to have tested for HIV and less likely to report serodiscordant partners. Community acceptance was associated with having tested for HIV. Efforts to address YMSM's exposure to structural barriers in Detroit Metro are needed to inform HIV prevention strategies from a socioecological perspective.

Resumen

Las características estructurales están asociadas a los riesgos de VIH/ETS; sin embargo, pocos estudios han examinado qué mecanismos influyen en las conductas de riesgo de VIH/ETS de los hombres jóvenes que tienen sexo con hombres (YMSM). Utilizando datos de una encuesta de YMSM (edades 18–29) que viven en el área metropolitana de Detroit (N = 328; 9% VIH positivo; 49% Negro, 27% blancos, 15% latinos, 9% Otros raza), utilizamos un modelo multinivel para examinar la asociación entre las características a nivel comunitario (por ejemplo, la desventaja socioeconómica, la distancia a las instituciones LGBT afirman) y dos conducta: el testeo de VIH y

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la probabilidad de tener relaciones anales sin protección con pareja(s) serodiscordante(s). Incluimos factores individuales (raza/etnia, pobreza, falta de vivienda, uso de alcohol y marihuana) y contextuales (aceptación y estigma comunitario respecto a la sexualidad del mismo sexo). YMSM que viven en barrios con mayor desventaja socioeconómica y con más cercanía a organizaciones que proveen servicios de VIH/SIDA fueron más propensos a haber testeado y menos propensos a reportar relaciones sexuales con parejas serodiscordantes. Aceptación comunitaria se asoció con una mayor probabilidad de haber testeado. Esfuerzos para hacer frente a las barreras estructurales en Detroit son necesarias para elucidarel desarrollo de estrategias de prevención del VIH desde una perspectiva socio-ecológica.

Keywords

Social determinants; neighborhoods; socioeconomic disadvantage; testing

In the United States, one in every four people infected with HIV is unaware of his or her HIV status. This undiagnosed 25% of the HIV-infected population accounts for most new sexual infections per year (approximately 54 to 70% of all new cases) [1]; however, because reduction in HIV risk behavior is common after HIV diagnosis [2–3], researchers and community advocates have called for a substantial increase in the number of HIV-positive persons who are aware of their status. In response to this need, programs are underway to promote HIV testing as a routine procedure and to promote diagnosis of HIV in communities with high HIV prevalence and incidence [4].

HIV prevalence is often concentrated within areas vulnerable to systematic underinvestment in infrastructure and social services [5,6]. The Detroit Metro Area (DMA) exemplifies why structural & community factors need to be understood if we are to make progress in reducing HIV. The DMA is the state of Michigan's HIV epicenter, with men who have sex with men (MSM) accounting for over 70% of all cases [7]. The city of Detroit carries the burden within the DMA. Compared to other US cities, Detroit is one of the poorest and most racially segregated cities in the United States [8], with more than 80% of inhabitants residing in the city of Detroit identifying as Black according to the 2010 US Census. The confounded patterns of socioeconomic disadvantage and racial/ethnic segregation within Detroit are also apparent within its metropolitan area, with most of the White populace in the region living in more affluent suburban cities serving as boundaries to the city of Detroit. The disparities faced within the region are also reflected in the HIV prevalence. Over two thirds of diagnosed HIV-positive MSM in Michigan reside in Southeast Michigan, with the largest increases in new HIV infections observed among Black and Latino young MSM (YMSM) between the ages of 13 and 29 living in Detroit [7]. These epidemiologic trends are a glaring reminder of the systemic inequality faced by racial/ethnic minority MSM [9–11]. Given the pressing need to integrate socioecological frameworks into HIV prevention, our study focuses on how structural factors are associated with YMSM's HIV risk behaviors within the DMA.

Structural factors refer to the social and economic environments that shape the distribution of resources and barriers within a society [12–15]. For example, researchers have noted that

individuals living in neighborhoods with greater concentrated socioeconomic inequity will have greater exposure to negative health risk factors due to weakened social cohesion and prosocial norms [16–19]. In studies of heterosexual youth, researchers have noted that youth living in disadvantaged neighborhoods is weak are more likely to report earlier sexual debut, greater number of partners with whom they have condomless sex, and less access to HIV prevention services [17–19]. At present, however, the mechanisms through which structural factors influence risk-taking among YMSM remains understudied [16]. While complex, researchers [16, 20] have proposed different pathways between the environment and sexual risk behaviors including (a) increased exposure to physical (e.g., number of venues offering alcohol) and social (e.g., concentrated socioeconomic disadvantage) characteristics of the built environment, (b) limited collective efficacy (e.g., services for MSM) and/or greater social stigma (*e.g.*, sexual prejudice), (c) situational factors (e.g., partner characteristics and behaviors), and (d) compounded exposure to other risk behaviors (*e.g.*, substance use). In light of these prior findings, we sought to examine whether negative structural factors (*e.g.*, socioeconomic disadvantage; community stigma) were associated with the HIV risk behaviors of YMSM who live in the DMA.

Although attention to structural risk factors and their role in HIV transmission has received greater attention in recent years, most of this work has primarily focused on deficits [21]. As a result, less is known about the structural factors that may be LGBT identity affirming and associated with fewer HIV risk behaviors [16]. Community capacity [22], as measured by tangible (*e.g.*, access to culturally-appropriate services) and non-tangible (*e.g.*, perceived belongingness) resources, may facilitate the development of strong social bonds that protect individuals and their communities [23]. Access to structural factors that affirm LGBT identity, for example, may provide a protective effect against engaging in behaviors that may increase individuals' vulnerability to HIV and other STI [24]. Frye et al.[25], for example, used archival data from a probability sample of YMSM (n=385) living in New York City during 1999–2000 and found that consistent condom use during anal intercourse was higher among YMSM living in neighborhoods with a greater percent of same-sex headed households. Similarly, Buttram and Kurtz [26] found that substance-using MSM living in LGBT neighborhoods in South Florida were less likely to meet DSM-criteria for substance dependence than counterparts living outside these neighborhoods. Although these data support the notion that LBGT neighborhoods may be associated with greater risk reduction among MSM who live in these areas, Mills and colleagues [27] found that MSM living in 4 cities (New York, Los Angeles, Chicago, and San Francisco) with prominent LBGT neighborhoods were not comparable to those who peers living outside of these neighborhoods: MSM living within LGBT neighborhoods were more likely to be White, have greater socioeconomic resources, have come out, and more likely to have tested for HIV. In light of these findings and recognizing that many cities and towns around the United States and elsewhere do not have formalized LGBT neighborhoods, as is the case of the DMA, we sought to examine whether the presence of LGBT-affirming institutions within a geographic area could serve as a health-promoting resource.

AIDS Service Organizations (ASOs) and LGBT bars and centers have a long history of conducting HIV outreach among gay, bisexual and other MSM in the United States. ASOs and LGBT venues are often perceived as more trustworthy, LGBT-friendly, and/or accessible

than other sources (*e.g.*, hospitals, primary care providers). For example, delivery of HIV prevention through ASOs and LGBT venues has been an efficient roll-out mechanism because they reach and affect large numbers of people, create and establish policies and procedures that maximize the diffusion of interventions, increase program sustainability and advocacy, and incorporate the needs of specific communities into their services [28–29]. These institutions may also influence the social awareness and visibility of HIV prevention messages in the region. For example, living closer to an ASO or LGBT-affirming venue provides more visibility to health promoting campaigns in those neighborhoods and reinforce HIV testing behavior or condom use norms. Although the use of geographic methods is increasingly prominent within public health [19], particularly to identify high-risk groups within a geographic area [30–32], the use of geographic indicators as correlates of HIV risk among YMSM remains underused. Distance between individuals' place of residence and location of service, for example, is a useful measure of reach within an agency's catchment area. In a study by Leibowitz and colleagues [33], travel distance required for low-income residents in Los Angeles County to access publicly-funded testing sites, including bars and bath houses, was associated with decreased likelihood of accessing HIV services and decreased likelihood of HIV testing. Similarly, Zenilman and colleagues [34] found that the partners of patients from a Baltimore STD clinic were more likely to live nearby, suggesting that partner selection is a function of geographic location and not a random process. While distance does not fully capture the complexity of why individuals adapt certain behaviors, it remains a useful proxy for understanding the physical boundaries of the catchment areas of venues offering health-promoting services. Thus, we contribute to this body of literature by examining how distance may be associated with HIV testing likelihood as well as sexual risk among YMSM in the DMA.

Study Goal and Objectives

The overall goal of our study was to examine how structural characteristics in YMSM's social context were associated with their HIV risk behaviors. Our study had three objectives. First, we sought to examine whether negative structural factors (e.g., neighborhood socioeconomic disadvantage; perceived sexual prejudice in the community) were positively associated with YMSM's HIV risk behaviors (i.e., HIV testing and unprotected anal intercourse with one or more partners of sero-unknown or sero-discordant status). Second, building on a community capacity perspective, we tested whether proximity to LGBT-affirming spaces (e.g., ASOs, LGBT bars/clubs, and LGBT centers) and perceived social acceptance were negatively associated to YMSM's risk behaviors, above and beyond their neighborhood's socioeconomic disadvantage. Finally, we examined whether these relationships persisted after accounting for YMSM's demographic characteristics (e.g., age, race/ethnicity, education, poverty, homelessness, sexual identity, HIV status) and substance use behaviors.

METHODS

Data for this paper come from a community-based participatory research (CBPR) study examining the HIV-related structural and psychosocial vulnerabilities experienced by YMSM in the DMA [35]. To be eligible for the study, participants had to be between the

ages of 18 and 29 (inclusive), identify as cis-male or transgender, report currently residing in the DMA (as verified by zip code and IP address), and report having had sex with men.

Participants were recruited online and in-person through a convenience sample. On the Internet, advertisements were posted on Black Gay Chat Live (BGC Live) and Facebook. In-person recruitment occurred across gay bars, clubs, and community events frequented by the target population, as well as by referrals from staff from community partner agencies, clinics, and other agencies in the DMA working with YMSM (*i.e.*, LGBT organizations, ASOs, and community and university health clinics). Advertisements displayed brief information about the survey, a mention of a $30 VISA e-gift card incentive upon completion, and the survey's website.

We recorded a total of 1,183 entries between May and September 2012. We used best practices [36–37] to identify duplicates and falsified entries (N = 341; 28.8% of all recorded entries). Prior to payment, research assistants verified submitted web-survey data on a daily basis using a triangulation of several strategies that included: (a) verifying that the geographic (e.g., residential) and virtual (e.g., IP) addresses corresponded to the DMA, (b) examining whether irregular answer patterns existed within an entry, (c) computing whether the time taken to complete a survey was realistic or could be the result of a "bot", and (d) cross-checking data for similar e-mail addresses in our participants' database and web-presence in social media (e.g., Facebook). Participants flagged as suspicious were sent an e-mail asking them to call and verify their data. Of the remaining 842 recorded screeners, we found 381 entries were ineligible to participate in our survey based on study criteria. We concluded with an analytic sample of $N = 461$ sexual minority youth, of which 32 (6.94%) were eligible and consented but did not commence the survey (*i.e.*, a study completion rate of 93.05%). For those questionnaires that were incomplete, participants were sent two reminder emails that encouraged them to complete the questionnaire; one email was sent a week after they had started the questionnaire and another was sent a week before the questionnaire was scheduled to close. Sixty-nine participants had incomplete data and were excluded from the current analysis. We also excluded transgender identified participants (N=32) from the current analysis because we had insufficient sample size to make reliable inferences from this subgroup.

Procedures

Study data were protected with a 128-bit SSL encryption and kept within a firewalled server. Upon entering the study site, participants were asked to enter a valid and private email address, which served as their username. This allowed participants to save their answers and if unable to complete the questionnaire in one sitting continue the questionnaire at a later time. Upon completing an eligibility screener, eligible youth were presented with a detailed consent form that explained the purpose of the study and their rights as participants, and were asked to acknowledge that they read and understood each section of the consent form.

Consented participants then answered a 45–60 minute questionnaire that covered assessments regarding their socio-demographic characteristics, HIV status, individual-level characteristics (*i.e.* sexual and substance use behaviors), perceptions and experiences with community (*e.g.* social networks, neighborhood, stigma, participation in minority

communities), general mood over the last few months, and their hopes and dreams. Participants were compensated via e-mail upon completion of the questionnaire. We acquired a Certificate of Confidentiality to protect study data. The University of Michigan Institutional Review Board approved all study procedures.

Measures

Individual-level Characteristics

HIV Testing and Status: We asked YMSM to indicate whether they had ever tested for HIV and their HIV status. We used these two questions to categorize our sample of YMSM into HIV-positive, HIV-negative, and HIV-unknown status.

Number of Sexual Partners: Participants were asked to report their sexual behavior with men during the previous 30 days using the Sexual Practices Assessment Schedule [38]. Questions were asked both in formal language and vernacular (in italics) to increase comprehension. Participants who reported having unprotected receptive (URAI) and/or unprotected insertive (UIAI) sex with their partners were asked, “Of those men, how many told you that they were HIV-negative and you had no reasons to doubt it?”, “Of those men, how many told you they were HIV-positive?”, and “Of these men, how many did not tell you their HIV status?”. The web-survey was programmed to verify that the total number of UAI partners reported corresponded to the total sum of these three questions. We created a dummy variable to measure the risk of having one or more potentially serodiscordant partner(s) during UAI in the previous two months (0 = seroconcordant, 1=one or more serodiscordant partners). Among HIV-negative participants, having a serodiscordant partner was operationalized as having one or more partners who were HIV-positive or of unknown status. Among HIV-positive participants, a serodiscordant partner was operationalized as having one or more partners who were HIV-negative or of unknown status. Among participants with HIV-status unknown, having a serodiscordant partner was operationalized as having one or more partners who were HIV-negative, HIV-positive, or of unknown status.

Sociodemographic Characteristics: Participants were asked standard demographic characteristics regarding their age, sexual identity, gender identity, race/ethnicity, educational attainment, residential stability, and relationship status. We asked participants to indicate which of the following terms corresponded with their primary sexual identity: gay or homosexual, bisexual, straight/heterosexual, and same gender loving, MSM, or other. For the purposes of these analyses, we collapsed participants’ answers into gay/homosexual versus other sexual identity. Gay respondents served as the referent group in our analyses because they represented the largest sample size of all reported sexual identities. Participants indicated their race (Black/African American, White, American Indian/Alaskan Native, Asian, Native Hawaiian/Pacific Islander, and Other) and Spanish/Hispanic/Latino ethnicity. Most Latinos identified as White/European American and/or as Other, making it difficult to have sufficient cases to represent other Latino racial subgroups (e.g., Black Latino, Asian Latino, and/or Native American Latino) in our multivariate analyses. We also combined American Indian/Alaskan Native, Asian, Native Hawaiian/Pacific Islander, and other race categories given the limited number of observations, and then created dummy variables for each race/ethnicity group. White respondents served as the referent group in our analyses.

Participants noted their highest educational attainment (1=Less than High School; 2=High School or GED; 3=Technical/Associate Degree; 4=Some College; 5=College or graduate work). Residential instability was ascertained by whether or not (0=No; 1=Yes) participants had spent at least one night in the past 30 days in a shelter, public place not intended for sleeping (*e.g.*, bus station, car, abandoned building), on the street or outside, in a temporary housing program, or in a welfare or voucher motel [39]. Participants were also asked if they were currently in a relationship (0=No; 1=Yes). Annual income was collapsed into a dichotomous variable that indicated whether participants lived above the 2012 federal poverty line (*i.e.*, $11,170;0=No; 1=Yes).

Substance Use: We used two items from the National Survey on Drug Use and Health to assess how often participants had used alcohol and marijuana in the past 30 days (1 = 0 Times; 2 = 1–2 Times; 3 = 3–5 Times; 4 = 6–9 Times; 5 = 10–19 Times; 6 = 20–39 Times; 7 = 40+ Times).

Nearest Distance to Community Resources: Participants were asked to report their current residential address as part of the survey. Acknowledging that some participants were residentially unstable and/or would not want to give their exact location, the survey instructed participants to note the cross-streets where they lived (when appropriate) or spent most of their time (if residentially unstable). These data were then cleaned and geocoded using ArcGIS [40]. In addition to producing maps to visually display data, we used the ArcMap feature in GIS to conduct spatial analyses of these data. We created a listing of all LGBT bars and clubs through gay magazines and online searches, and HIV testing sites and ASO locations were included if listed in NPIN's database, AIDSVu test locators, and/or listed in other gay magazines and/or other online searches. After identifying the AIDS Service Organizations (ASOs; n=11), LGBT organizations (n=11), and LGBT bars and clubs (n=26) and entering them into ArcGIS, we calculated the distance from each participant to each venue in the DMA. We then selected the shortest distance (i.e., nearest venue of each kind) for our analyses. Distances were reported in miles.

Community Stigma and Community Acceptance: We used the two subscales of the Perceptions of Local Stigma scale [41] to examine YMSM's perceived sexuality-related stigma and perceived community acceptance, respectively. Item wording was adapted to ensure that the measurement was specific to the DMA. To ascertain sexuality-related stigma (Cronbach's $\alpha = .81$), participants answered three items (e.g., "Most people in the Detroit Metro Area feel that a man having sex with a man is a sign of personal failure.") on 4-point scale (1 = Strongly Disagree; 4 = Strongly Agree). Greater mean scores reflected greater local community stigma.

We measured perceived community acceptance (Cronbach's $\alpha = .83$) using four items on the same 4-point scale (*e.g.* "Most people in the Detroit Metro Area will willingly accept a man who has sex with men as a close friend."). We computed a mean score for each participant, with greater scores indicating greater community acceptance.

Neighborhood-level Characteristics

Neighborhood Economic Disadvantage: We defined neighborhood as Census tracts. We linked study data with 2010 Census information based on address information reported by respondents. Participants were sampled from 231 tracts. Although originally we sought to examine racial/ethnic segregation and socioeconomic disadvantage jointly at the tract-level, we did not include these two predictors concurrently due to multicollinearity concerns (*r.*=75).

We created a standardized neighborhood concentrated economic disadvantage score [42] through a Principal Axis Factor analysis with Varimax rotation using Census data. This composite score (α = .75) had a one-factor solution that explained 59.96% of the variance (Eigenvalue=3.40), and included five indicators: percent of households in poverty (*M*=24.98, *SD*=17.89; factor loading = .80), percent of households receiving public aid (*M*=5.61, *SD*=5.15; factor loading = .81), percent of single-headed households with children under the age of 18 (*M*=47.82, *SD*=29.59; factor loading = .72), unemployment percentage (*M*=10.26, *SD*=5.56; factor loading = .76), and percentage of residents over the age of 25 without a high school diploma (*M*=16.22, *SD*=11.81; factor loading = .77). We then created a z-score measure based on these 5 indicators.

Data Analytic Strategy

After examining the univariate statistics of our sample, we used the HLM2 command in HLM7 [43] to design our multilevel models. We used multilevel logistic regression to estimate the odds of having ever tested for HIV and the odds of engaging in condomless anal intercourse with one or more partners of serounknown or serodiscordant status, partitioning each outcome's variance by its individual (Level One) and neighborhood (Level Two) components concurrently [44]. We estimated the fully-unconditional model as a first step to examine whether there was nested variation in our outcomes and to compute our intra-class correlation (ICC). Once the ICC was estimated, we modeled the individual-level predictors (*i.e.*, sociodemographic factors, behavioral risk correlates, and community-level indicators) alongside our Census tract-level variable (*i.e.*, socioeconomic disadvantage). Although originally we sought to examine racial/ethnic segregation and socioeconomic disadvantage jointly at the tract-level, we did not include these two predictors concurrently due to multicollinearity concerns (*r.*=75). We report our findings as fixed-effect models (***i.e.***, population-average model with robust standard errors) using $p \leq .05$ as criterion for statistical significance. For brevity, only statistically significant findings are discussed in the Results sections.

RESULTS

Sample Description

Our sample's mean age was 23 years of age (*sd* = 2.83). Black/African American participants (N = 160, 48.9%) were the largest racial/ethnic subgroup represented in our analyses, followed by White/Caucasian (N = 88, 26.8%), Latinos (N = 50, 15.2%), and participants who identified with other races/ethnicities (N = 30, 9.1%). Most of the sample identified as gay (N = 273, 83.3%). Ninety-two percent of the sample had a high school

education or higher. Over 40% of the sample reported being in a relationship (see Table 1). One hundred forty five participants (44.2%) reported an annual income below the federal poverty line and 39 (11.9%) had unstable housing (1 or more nights homeless/transient) in the prior 30 days.

A majority of our participants reported ever having tested for HIV (N = 284, 86.6%). The majority of the sample reported being HIV-negative (N = 254, 77.4%). Nine percent of the sample was HIV-positive. On average, participants reported having more than one male partner in the prior 30 days (M = 1.60; *sd* = 2.63). Over forty percent of the sample reported engaging in unprotected anal intercourse in the prior 30 days. Nineteen percent of YMSM who had UAI reported having one or more partners of unknown or discordant serostatus.

The number of participants per Census tract ranged from 1 to 6. On average, neighborhoods included in the analysis were characterized as having greater socioeconomic disadvantage than the average neighborhood in the DMA (*M* = .46, *sd* = 1.05). In regard to YMSM's geographic proximity to community resources, participants' location averaged 6.28 miles (*sd* = 5.92) to the nearest ASO (see Figure 1), 5.16 miles (*sd* = 5.64) to the nearest LGBT bar, and 4.11 miles (*sd* = 4.31) to the nearest LGBT center. We compared YMSM who lived in more disadvantaged neighborhoods (i.e., above the mean) to those who lived in neighborhoods with less disadvantage regarding their distance to these community resources. YMSM living in more disadvantaged neighborhoods lived closer to an ASO (*M* = 4.04, *sd* = 4.05) compared to those in less disadvantaged neighborhoods (*M* = 10.12, *sd* = 6.68; $t_{(177.87)}$=9.00, p <.001). YMSM living in more disadvantaged neighborhoods lived closer to a LGBT Center (*M* = 3.35, *sd* = 3.59) compared to those in less disadvantaged neighborhoods (*M* = 8.50, *sd* = 6.68; $t_{(163.59)}$=7.65, p <.001). YMSM living in more disadvantaged neighborhoods lived closer to a LGBT bar/club (*M* = 2.55, *sd* = 2.48) compared to those in less disadvantaged neighborhoods (*M* = 6.95, *sd* = 5.20; $t_{(156.18)}$=8.72, p <.001). On average, YMSM reported higher community stigma scores than community acceptance (see Table 1).

HIV Testing Behavior

Prior to entering our covariates in the model, we estimated the fully unconditional model. The intra-class correlation in our fully unconditional model was 5.01%. Inspection of the random effects table indicated that there was significant variation to be estimated through a nested model ($X^2_{(255)}$=596.93; *p*< .001).

YMSM living in areas with greater socioeconomic disadvantage were more likely to report having ever tested for HIV (*OR* = 1.71, 95% CI: 1.16–2.54, *p* < .01). YMSM living further away from an ASO (*OR* = .37, 95% CI: 0.20–0.70, *p*< .01) were less likely to have ever tested for HIV. YMSM who reported greater community acceptance (*OR* = 1.67, 95% CI: 1.10–2.56, *p*< .05) were more likely to have tested for HIV. We observed no association between odds of HIV testing and community stigma, or geographic proximity to a LGBT Organization or LGBT Bar.

African American participants were more likely to have ever tested for HIV than White counterparts (*OR* = 3.85; 95% CI: 1.45–10.24; *p*<.01). We observed no other differences by

race/ethnicity. YMSM were more likely to have ever tested for HIV if they were currently in a relationship (*OR* = 1.91; 95% CI: 1.02–3.57; $p < .05$) and less likely to have tested if they lived below the poverty line (*OR* = 0.29; 95% CI: 0.13–0.67; $p < .01$). We observed no association between odds of HIV testing and age, educational attainment, sexual identity, residential instability, or alcohol or marijuana use (see Table 2). No nested variation remained unaccounted for in our final ($X^2_{(231)}$=226.94; *n.s.*).

Having Serodiscordant Partner(s) in prior 30 days

Prior to entering our covariates in the model, we estimated the fully unconditional model. The intra-class correlation in our fully unconditional model was 9.80%. Inspection of the random effects table indicated that there was significant variation to be estimated through a nested model ($X^2_{(255)}$=1948.35; $p < .001$).

YMSM living in areas with greater socioeconomic disadvantage were less likely to report having one or more serodiscordant partners in the prior 30 days (*OR* = 0.58, 95% CI: 0.40–0.84, $p < .01$). YMSM living further away from an ASO (*OR* = 3.42, 95% CI: 1.36–8.61, $p < .01$) were more likely to have had serodiscordant partner(s). We observed no association between partner serodiscordance and community acceptance or community stigma, or geographic proximity to a LGBT Organization or LGBT Bar.

YMSM were more likely to report having serodiscordant partner(s) if they lived below poverty (*OR* = 2.52; 95% CI: 1.31–4.87; $p < .01$) or had used alcohol more frequently in the prior 30 days (*OR* = 1.22; 95% CI: 1.04–1.48; $p < .05$). YMSM in a relationship (*OR* = 0.55; 95% CI: 0.32–0.94; $p < .05$) were less likely to report having serodiscordant partner(s) than participants who identified as single. We observed no association between odds of having a serodiscordant partner and age, race/ethnicity, educational attainment, sexual identity, relationship status, residential instability, or marijuana use (see Table 3). No nested variation remained unaccounted for in our final ($X^2_{(231)}$=226.94; *n.s.*).

DISCUSSION

Researchers, advocates and policymakers have acknowledged the importance of structural and community factors in HIV prevention and care efforts [20]. For the current study, we sought to examine the associations between HIV testing and UAI with serodiscordant partners, and the risk (*e.g.*, socioeconomic disadvantage; community stigma) and health-promoting (*e.g.*, distance to LGBT-affirming community agencies; community acceptance) characteristics of the environments in which YMSM live. Our findings confirm and expand literature that emphasizes the importance of neighborhood influences on individual behaviors.

Structural risk factors within communities have been linked to greater regional HIV prevalence and incidence. We expected to find an association between neighborhood-level structural risk (*e.g.*, socioeconomic disadvantage) and individual-level risk exposure. However, contrary to expectations, we found that YMSM who lived in neighborhoods with greater socioeconomic disadvantage were more likely to report having tested for HIV and were less likely to report UAI with serodiscordant partner(s) than YMSM in less

socioeconomically disadvantaged neighborhoods. These relationships persisted after accounting for YMSM's sociodemographic characteristics and behavioral risk. These multilevel findings align with prior longitudinal research with heterosexual African American urban youth living in Flint, Michigan, where neighborhood disadvantage has been associated with more consistent condom use [45] and increased rates of HIV testing [46]. While causality may not be ascertained from these data, the observed, counter-intuitive relationships may be indicative of on-going public health efforts seeking to address the HIV disparities present in socioeconomically underserved settings by providing HIV prevention services to individuals living in these areas. Nevertheless, although our structural findings suggest that greater structural resources are related to better individual-level outcomes, care should be taken in avoiding the ecological fallacy when interpreting our results, *i.e.*, making attributions about individuals based on neighborhood-level data. Although neighborhood disadvantage was associated with greater HIV testing, for example, we found that YMSM whose income fell below the federal poverty line were less likely to report ever receiving an HIV test and more likely to report partner serodiscordance. These findings underscore the importance of developing multilevel HIV interventions that address socioeconomic factors at the neighborhood and individual level [47]. Given that the mechanisms through which neighborhood-level factors may be associated with sexual risk-taking remain unclear, however, our findings underscore the importance of examining how social contexts may shape risk-taking differentially in future research efforts.

From a health promotive perspective, we found that HIV testing was associated with greater community acceptance among YMSM, underscoring the importance of promoting LGBT-friendly environments in HIV prevention and care [25–27]. After accounting for community acceptance, we tested whether proximity to LGBT-affirming spaces was associated with YMSM's HIV risk behaviors. Consistent with a community capacity perspective, YMSM who resided in closer proximity to an ASO were more likely to live in socioeconomically disadvantaged areas. Even after accounting for neighborhood socioeconomic disadvantage, YMSM living in closer proximity to an ASO were more likely to report HIV testing and less likely to report having UAI with serodiscordant partner(s). We did not observe any association between YMSM's HIV risk and proximity to LGBT bars or organizations. Although further research is needed to explore the concept of catchment area (*i.e.*, area that attracts and provides services to individuals) and the use of nearest distance as a proxy, it is plausible that HIV prevention messages and resources are most concentrated geographically around their location of origin, *i.e.* ASOs, and then dissipate in strength as they move further from the site. These findings coincide with prior researchers call to employ geospatial models when seeking to identify core groups at high risk and propose structural interventions [32]. Future research, qualitative and quantitative, examining these mechanisms is needed.

Across our individual-level predictors, we found that African American YMSM were more likely to report having tested for HIV than their White counterparts. Greater HIV testing among African Americans may be associated with greater efforts to raise awareness of the disproportionate HIV burden encumbered by African Americans in the United States [10]. Greater consumption of alcohol use was also associated with partner serodiscordance,

underscoring the importance of addressing alcohol use as a sexual risk correlate among YMSM [48].

Strengths and Limitations

Several limitations of the current study should be noted. First, we were unable to model racial/ethnic density alongside socioeconomic disadvantage given the high correlation between these two Census indicators in our region. Second, 85% of our sample had ever tested for HIV, yet we were unable to determine when the testing occurred (i.e., testing within recommended CDC guidelines) or to ascertain if testing resulted from concern of having engaged in a specific risky encounter (e.g., having had sex with a serodiscordant partner). Examining HIV testing reasons may help to elucidate whether certain social norms promoted by social institutions are associated with YMSM's risk reduction behaviors. Third, our sample may not be generalizable to all YMSM, as each community may have a unique social and economic composition and history of HIV. Other social processes may operate within neighborhoods in different regions of the country. Unlike other metropolitan areas in the United States, Metro Detroit does not have LGBT-specific neighborhoods (e.g., Castro, Boystown, Chelsea). It is possible that these neighborhoods have distinctive sexual networks, perceptions of HIV/STI risk, and access to HIV testing and care services than those available in Metro Detroit. Furthermore, although we have included the nearest distance to each type of venue in our analyses, future research should examine whether HIV-related correlates vary based on whether YMSM live in closer proximity to areas with greater concentration of these venues. We also were unable to examine whether participants used their nearest institution or if they tested in venues that were further away. Finally, consistent with previous neighborhood studies, our findings are constrained by the endogeneity of community choice [20–21]. In other words, individuals may not be able to self-select and live in their community of choice due to historical and sociopolitical experiences of marginalization [49]. Consequently, it is plausible that unmeasured structural processes (e.g., housing discrimination, red lining) constrain participants' social contexts and their mobility.

Conclusions

Our results highlight the role that structural and community characteristics may be associated to HIV risk behaviors among YMSM living in the Detroit Metro Area. Our findings support the value of conducting area-wide initiatives that seek to overcome community barriers to accessing HIV services, and highlight the critical role that a socioecological analysis can play in identifying how structural risk and promotive factors are associated with YMSM's HIV risk behaviors.

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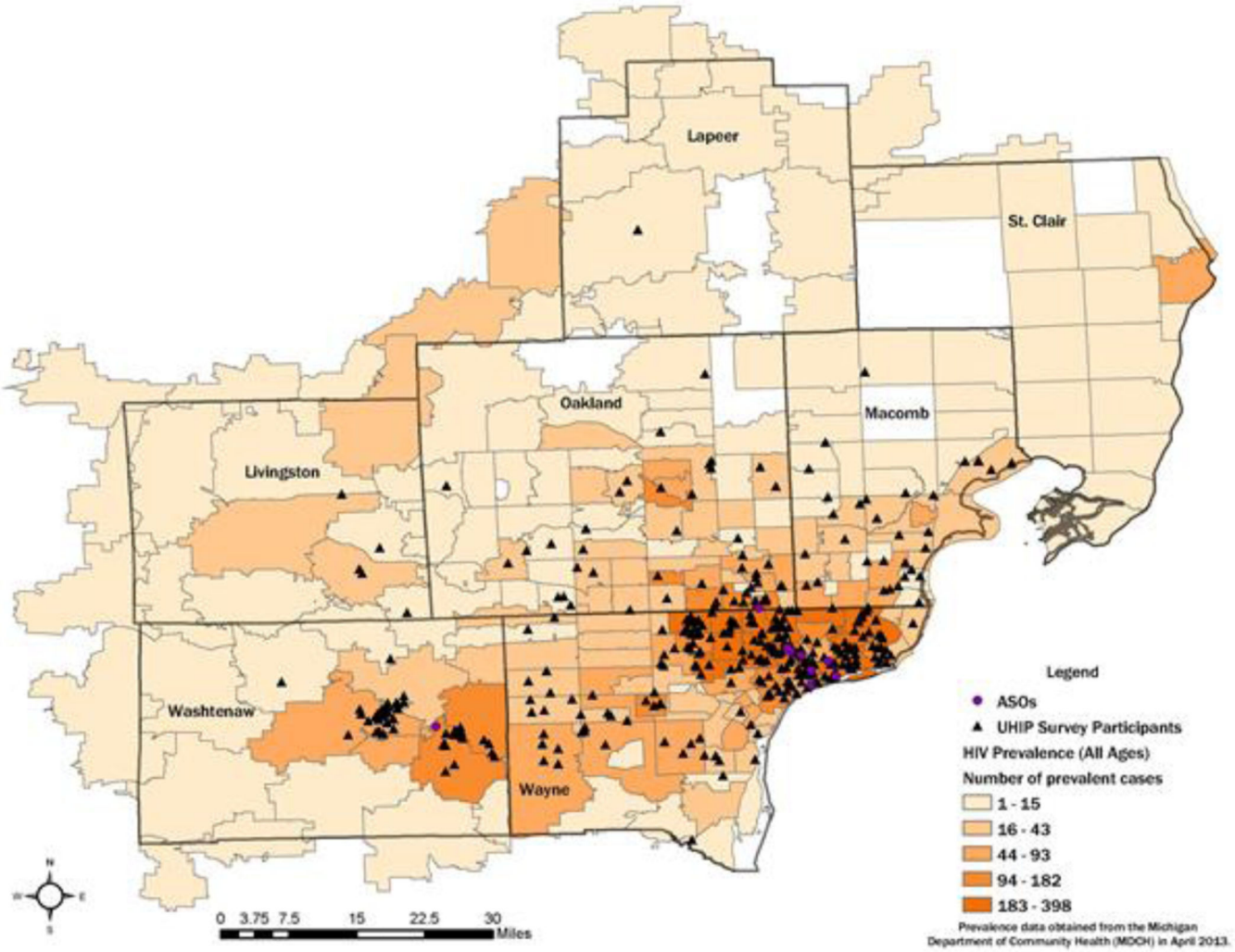

Figure 1.
Proximity of participants to AIDS Service Organizations by HIV prevalence regions

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Table 1

Descriptive Statistics of YMSM living in the DMA (N=328)

	Mean	(SD)	Range	N	(%)
Age	23.16	2.83	18–29		
Race/Ethnicity					
White				88	(26.8%)
Black				160	(48.9%)
Latino				50	(15.2%)
Other Race/Ethnicity				30	(9.1%)
Educational Attainment	3.45	1.30	1–5		
Sexual Identity					
Gay				273	(83.3%)
Bisexual				29	(8.8%)
Other Sexual Identity				26	(7.9%)
Poverty					
At or Below Federal Poverty				145	(44.2%)
Above Federal Poverty				183	(55.8%)
Residentially Unstable				39	(11.9%)
In Relationship				137	(41.8%)
Ever Tested for HIV				284	(86.6%)
HIV Status					
HIV-Negative				254	(77.4%)
HIV-Positive				30	(9.1%)
Unknown HIV Status				44	(13.4%)
Number of Male Partners	1.60	2.63	0–38		
Unprotected Anal Intercourse				135	(41.2%)
Number of URAI Partners	.46	1.23	0–15		
Number of UIAI Partners	.37	1.02	0–15		
1+ Serodiscordant Partner(s)				62	(18.9%)
Alcohol Use	3.42	1.59	1–7		
Marijuana Use	2.49	2.09	1–7		

	Mean	(SD)	Range	N	(%)
Community Acceptance	1.33	.70	1–4		
Community Stigma	2.66	.78	1–4		
Proximity Measures (in miles)					
Distance to Nearest ASO (N=11)	6.28	5.92	0.09–27.41		
Distance to Nearest LGBT Center (N=11)	5.16	5.64	0.09–26.58		
Distance to Nearest LGBT Bar (N=26)	4.11	4.31	0.04–24.12		
2010 Census-Level Data (N=231 Tracts)					
Socioeconomic disadvantage (*z-score*)	.46	1.05	−1.18–3.07		

Table 2

Multilevel Logistic Regression of Having Ever Tested for HIV among YMSM living in the DMA (N=328)

Fixed Effect	**Odds Ratio**	**95% Confidence Interval**	***t*-ratio**	***p*-value**
Intercept, β_{00}	5.68	(2.41,13.16)	4.00	0.001
Neighborhood Socioeconomic Disadvantage, γ_{01}	1.71	(1.16,2.54)	2.69	0.008
Sociodemographic variables				
Age, β_1	1.01	(0.89,1.13)	0.11	0.91
Race/Ethnicity[1]				
African American/Black, β_2	3.85	(1.45, 10.24)	2.75	0.008
Hispanic/Latino, β_3	1.30	(0.50,3.38)	0.55	0.58
Other Race/Ethnicity, β_4	2.67	(0.81,8.84)	1.64	0.11
Educational Attainment, β_5	1.27	(0.90,1.79)	1.40	0.17
Sexual Orientation[2]				
Bisexual Identified, β_6	0.64	(0.19,2.23)	−0.71	0.48
Other Sexual Identity, β_7	1.79	(0.40,8.11)	0.77	0.45
In a Relationship[3], β_8	1.91	(1.02,3.57)	2.06	0.04
Residentially Unstable[4], β_9	1.31	(0.48,3.56)	0.54	0.59
Poverty[5], β_{10}	0.29	(0.13,0.67)	−3.97	0.004
Behavioral Risk Correlates				
Alcohol Use, β_{11}	0.80	(0.63,1.01)	−1.90	0.06
Marijuana Use, β_{12}	0.97	(0.80,1.18)	−0.31	0.75
Community-Level Correlates				
Distance from Nearest ASO, β_{13}	0.37	(0.20,0.70)	−3.11	0.003
Distance from Nearest LGBT Center, β_{14}	0.66	(0.32,1.38)	−1.13	0.26
Distance from Nearest LGBT Bar/Club, β_{15}	0.86	(0.31,2.42)	−0.28	0.78
Community Acceptance, β_{16}	1.67	(1.10, 2.56)	2.45	0.02
Community Stigma, β_{17}	0.91	(0.60,1.34)	−0.48	0.64

[1] White participants serve as referent group;

[2]Gay identified participants serve as referent group;

[3]Single participants serve as referent group;

[4]Participants who did not experience residential instability in the prior 30 days serve as referent group;

[5]Living above poverty line serve as referent group.

Table 3

Multilevel Logistic Regression of Having One or More Serodiscordant UAI Partners (past 30 days) among YMSM living in the DMA (N=328)

Fixed Effect	**Odds Ratio**	**95% Confidence Interval**	***t*-ratio**	***p*-value**
Intercept, β_{00}	0.21	(0.09,0.43)	−4.19	0.001
Neighborhood Socioeconomic Disadvantage, γ_{01}	0.58	(0.40,0.84)	−2.92	0.01
Sociodemographic variables				
Age, β_1	1.01	(0.91,1.13)	0.20	0.84
Race/Ethnicity[1]				
African American/Black, β_2	0.81	(0.35,1.88)	−0.50	0.62
Hispanic/Latino, β_3	0.87	(0.36,2.13)	−0.31	0.76
Other Race/Ethnicity, β_4	0.71	(0.26,1.94)	−0.69	0.50
Educational Attainment, β_5	0.92	(0.69,1.24)	−0.54	0.59
Sexual Orientation[2]				
Bisexual Identified, β_6	1.47	(0.55,3.92)	0.78	0.44
Other Sexual Identity, β_7	0.78	(0.21,2.97)	−0.37	0.71
In a Relationship[3], β_8	0.55	(0.32,0.94)	−2.22	0.03
Residentially Unstable[4], β_9	0.65	(0.26,1.62)	−0.95	0.35
Poverty[5], β_{10}	2.52	(1.31,4.86)	2.81	0.01
Behavioral Risk Correlates				
Alcohol Use, β_{11}	1.22	(1.04,1.48)	2.03	0.04
Marijuana Use, β_{12}	1.13	(0.95,1.33)	1.43	0.16
Community-Level Correlates				
Distance from Nearest ASO, β_{13}	3.42	(1.36,8.61)	2.66	0.01
Distance from Nearest LGBT Center, β_{14}	1.78	(0.81,3.89)	1.7	0.15
Distance from Nearest LGBT Bar/Club, β_{15}	1.01	(0.22,4.70)	0.01	0.99
Community Acceptance, β_{16}	0.70	(0.48, 1.02)	−1.91	0.06
Community Stigma, β_{17}	0.99	(0.70,1.42)	−0.01	0.99

[1] White participants serve as referent group;

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[2] Gay identified participants serve as referent group;

[3] Single participants serve as referent group;

[4] Participants who did not experience residential instability in the prior 30 days serve as referent group;

[5] Living above poverty line serve as referent group